2) Due to the high carrying capacity. One hanging tram replaces 2 - 3 buses because its relative cost will be low;

3) Compact of passenger stations, parking sides due to the small size of the suspended trams and their small amount necessity, no-existence of pedestrian crossings, intersections, overpasses, multilevel solution reduces the cost of transport infrastructure, depreciation and operating costs on it;

4) Lack of land occupied by the transport system will free land for urban development that will bring no additional cost, and vice versa - additional revenue;

5) High environmental friendliness of the vehicle compared to any other city transport.

"Second level" transport gives an opportunity to build roads with large span. It has a high speed, relatively inexpensive highly profitable system with low-cost using and low-cost travel.

References

1. Unitsky A.E. String Transport System (options), the method of manufacture and assembly rail span segment string thread (3 inventions). Eurasian patent №005017, Cl. The E 01 25/24, 2003.

2. Borin A.A. By the estimation of the energy of perfection of various modes of transport // Scientific notes TSAGI.- -T.2 1971, №6, pp. 140-145.

3. Unitsky A.E. String Transport Systems on Earth and in space. - Gomel Infotribo, 1995. - 337 p .: ill.

4. Petrenko O.S. Suspended rail road. M. Machinery. 1981.

ANALYSIS OF VARIOUS CONSTRUCTIVE FACTORS INFLUENCING THE STRENGTH OF GLUED STEEL-CONCRETE JOINTS WITHOUT ANCHORS

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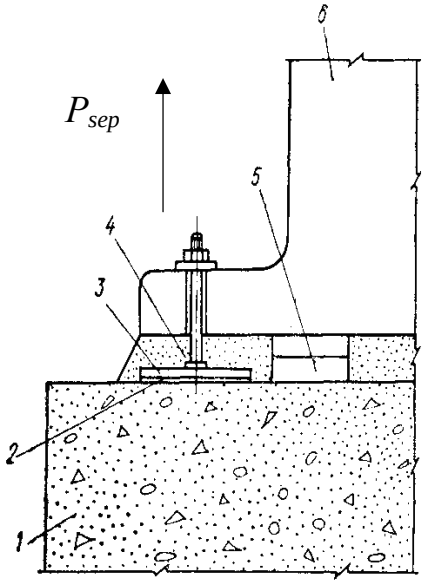
In the process of building, exploitation, reconstruction of industrial enterprises a need arises to carry out installation works and equipment mounting on constructed and existing foundations, production lines and other auxiliary devices. Therefore, it is important to use rational fixing methods for various technological equipment on the foundations, concrete or reinforced concrete structures. In addition to traditional methods of equipment, fastening a joint without anchors can be successfully used. Mounting by this method is carried out by gluing clamping units or equipment basic parts on concrete surface (Picture 1). It is possible to use any adhesives, etc., that have sufficient adhesion on concrete and steel as well as high physical and mechanical properties.

A large number of scientific works are dedicated to studying and development of constructions using equipment mounting by a joint without anchors. Such leading Ukrainian scientists as Prof. Zolotov M.S., Prof. Shutenko L.M., Prof. Skrypnik M.O. and others have been engaged into fundamental researches and development of high-

strength acrylic adhesives. However, in connection with acrylic adhesive's wide application in construction, the abovementioned authors suggest to use these adhesives in the design of joints without anchors. In addition, several researches have proved that acrylic adhesives have a good adhesion to concrete and steel. Moreover, the destruction of the glued steel-concrete joint with a uniform separation regardless of the acrylic adhesive composition happened on the concrete surface line.



Picture 1. Scheme of equipment mounting to prepared foundations using the method without anchors:

1 – foundation; 2 – adhesive layer; 3 – mount joint; 4 – filling;

5 – mounting pads; 6 – equipment

In view with the abovementioned author's results, experiments on determining the effect of steel plates stiffness on the adhesive strength as well as the influence of the magnitude eccentricity of the separating forces application were performed. The procedure of samples preparation and carrying out the experiments is described in detail [1].

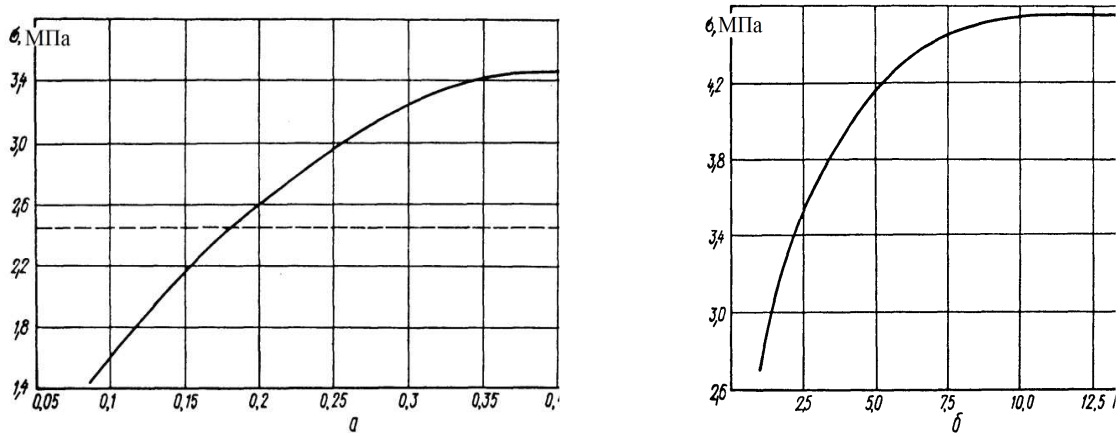
On the basis of the experimental data, dependency graphs of tensile strength changes of adhesive joints under a uniform separation from the glued plates rigidity (Picture 2, a) and the A_b / A_{sq} ratio magnitude (Picture 2, b) are given.

As it can be seen (Picture 2) an increase of the plates stiffness results in increasing of the adhesive strength. From the point when the relative plate's stiffness is $\Delta \geq 0{,}33$ further joint strength increase was not observed and for the square plate A_{sq} = 49 sm^2 the value was σ_{gl} = 3,43 IPA.

The pattern of adhesive joints strength change depending on the plate stiffness, received as the result of the experiments, confirmed the previous research in which the maximum strength value was also achieved at the relative plates' stiffness Δ = 0,33.

Adhesive joints strength growing as the result of relative steel plate's stiffness increasing should be explained by the fact that stiffness plate's increasing results in smoothing of the tensile stress sheet over the entire gluing area. Obviously, this

reduces the stress concentration at the load application site, i.e. in the center of the plate, and with the stiffness $\Delta \geq 0{,}33$ the tensile stress sheet under the plate takes a rectangular form. Concrete completely over the entire gluing area starts to work for a tension. This leads to getting of the maximum strength in the joints with the plates' stiffness of $\Delta \geq 0{,}33$.



Picture 2. The dependence of adhesive strength under uniform separation from:
a – relative steel plates' stiffness; b – ratio value A_b / A_{sq}

Graph data analysis (Picture 2) also helps to reveal the coincidence of the tensile strength values of concrete in tension and adhesive joint tensile strength with a uniform separation of the steel plate stiffness $\Delta = 0{,}18$. This value is $f_{ctk} = 2{,}46$ IPA and it is marked on the graph by a dotted line. For other plates' stiffness values that are different from $\Delta = 0{,}18$, the adhesive strength under uniform separation may be taken into account by decreasing or increasing transition coefficients from the values of the tensile concrete strength in tension.

The value of the coefficient K_Δ considering the relative steel plates' stiffness is given in the table:

Δ … 0.06	*0.09*	*0.12*	*0.15*	*0.18*	*0.21*	*0.24*	*0.27*	*0.30*	*0.33*
K_Δ *…0.40*	*0.57*	*0.74*	*0.85*	*1.00*	*1.11*	*1.16*	*1.28*	*1.33*	*1.37*

The changes in ratio of plates and concrete areas in the gluing zone significantly affect the joint strength. So, with the ratio *Ab* / A_{sq} increase of 8,16 times the adhesive strength increases more than in 1,5 times, after which the strength growth of the joint was not observed.

Thus, in real operation conditions of the adhesive joint in case of clamping units gluing to concrete or reinforced concrete structures, it is necessary to consider a possibility of increasing the strength in relation to the concrete tensile resistance value, depending on the timber knot distance from the foundation edge (construction). The glued steel plate impact on the part of the concrete sample surface (under real conditions they are foundations or constructions) is considered [1] and described in detail [2].

In addition, it is necessary to conduct theoretical researches and to solve the

problem of the timber knot structural characteristics influence on the concrete strength. The mathematical model of this connection has been developed [3].

References:

1. Zolotov M.S., Firsov P.M. The influence of timber knot constructive factors on the strength of glued joint without anchors / M.S. Zolotov, P.M. Firsov // Resources saving materials, constructions, buildings and structures. – Rivne: National University of Water Management and Nature Resources Use, 2015 – Issue 30. – p. 25-31.
2. Zolotov M.S., Simeyko I.V., Vorobyeva A.S. The compressed reinforced rods flexibility and bearing capacity dependence from various factors / M.S. Zolotov, I.V. Simeyko, A.S. Vorobyeva // Urban Economy. Engineering and Architecture. – Kharkiv: O.M. Beketov National University of Urban Economy, 2011 – Issue 99. – p. 456-462.
3. Firsov P.M. Calculation model of glued steel-concrete joint / P.M. Firsov // The proceedings of IV International Scientific Internet Conference. Construction, reconstruction and restoration of urban economy buildings. - Kharkiv: O.M. Beketov National University of Urban Economy, 2014 – p. 61-66.

INFLUENCE OF LOW FREQUENCY MAGNETIC FIELD ON THE ENVIRONMENT AND ON THE OBJECTS OF BIOLOGICAL NATURE

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Bioelectromagnetics is a relatively new area of science that deals with the interaction of electromagnetic energy with biological systems. Therefore, studies usually are carried out jointly by researchers from both biological/medical sciences and engineering/physical sciences: expertise in both areas is necessary.

All living organisms evolved on a giant magnet, the one called “Earth”. The strength of the geomagnetic field is about 40 μT. The earth’s magnetic field is quasi-static, varying only slightly with time and location. Natural static electric fields, under clear sky conditions are about 0.1 kV/m on the earth’s surface, field strengths of up to 30 kV/m are reached under clouds producing lightning.

In addition to these naturally existing electromagnetic fields, we live in an artificially created electromagnetic environment. Most commercial electrical systems operate at either 50 or 60 Hz. Electrical and electronic devices operating at this “power frequency” - such as hair dryers and refrigerators - are in everyday use. Furthermore, many of our daily activities are conducted near, and sometimes under, high-voltage transmission lines and lower-voltage distribution lines.

Even though the use of electricity began more than 100 years ago, the possibility that exposure in our daily activities to the electric and magnetic fields produced by various types of electrical equipment and facilities might have previously unrecognized adverse health effects. This topic has been a subject of concern, beginning about 1975.

At low frequencies, the electric and magnetic field components are